

# PATENT SPECIFICATION

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 (72) Inventors GUY BILLY and  
                 MARCEL VANBEVER



## (54) SEPARABLE COMPOSITE PAPER

(71) We, SOLVAY & CIE, a body corporate organised under the laws of Belgium of 33, Rue du Prince Albert, B-1050 Brussels, Belgium, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a composite (i.e. multi-layer) paper which is particularly suitable for use in interior decoration, i.e. as wallpaper, and for the production of posters.

Until comparatively recently, only papers produced from cellulosic fibres, of various grades depending on the envisaged application, were used for the production of wallpapers and posters. The papers thus obtained were applied, after coating with a suitable adhesive, to the surface concerned (hereinafter referred to as the "substrate") with the expectation that, after a certain time, namely a few days or weeks in the case of a poster, or a few years in the case of a wallpaper, they would be pulled off from their substrate in order to be replaced.

This pulling off or stripping generally proves to be a slow, unpleasant and dirty operation. Furthermore, it frequently requires the use of tools having a cutting edge, with the consequent risk of damaging the substrate.

In order to overcome these disadvantages there have more recently been developed detachable papers which are generally papers of higher quality exhibiting, in particular, a better tear strength. These papers can be used, with judiciously chosen adhesives, to cover a substrate satisfactorily, yet, after drying, they can be pulled off completely after having been detached from the substrate at one corner. To achieve this result it is necessary that the adhesive chosen should on the one hand have a sufficient permanent adhesive strength to hold the

paper in position during its period of use, but on the other hand should have an adhesive strength which is sufficiently low to allow subsequent pulling off without risk of tearing the paper.

In order to satisfy this double condition, the manufacturers have themselves applied to the paper a judiciously chosen adhesive which can be activated with water, and this has made the products expensive. Furthermore, the balance struck between the tear strength of the paper and the adhesive strength of the adhesive used may not be appropriate in the case of a subsequent application, because, when a previous paper is pulled off, a film of adhesive is generally left on the substrate.

It is an object of this invention to provide a paper which does not suffer from the above-mentioned disadvantages.

According to the present invention, we provide a composite paper wherein three layers are superimposed on one another, these layers comprising: a base layer, adapted to be applied to a substrate, consisting of at least 90% of cellulosic fibres; an intermediate layer consisting of polyolefin fibrils; and a face layer consisting of 80 to 50% of cellulosic fibres and 20 to 50% of polyolefin fibrils; the percentages being calculated on the dry weights of the constituents, and the layers, concerned.

In a preferred form of this paper, the base layer consists of substantially 100% of cellulosic fibres and the face layer consists of a paper produced from a pulp containing 25 to 35% of polyolefin fibrils and of 75 to 65% of cellulosic fibres, the percentages being calculated as before.

The polyolefin fibrils referred to herein are fibrillar polyolefin structures which in typical cases consist of highly stretched filaments, having a thickness of the order of 1 micron, connected to one another to form a three-dimensional network; the specific surface area of the material is preferably

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greater than 1 m<sup>2</sup>/g, and more preferably greater than 5 m<sup>2</sup>/g, and the length of the fibrils is preferably 1 to 25 mm.

These fibrils can advantageously be produced by the processes described in our Belgian Patent Specifications Nos. 742,358, 782,032, 782,033, 811,780 and 824,844.

If preferred, however, the fibrils can be prepared by other processes, for example, those described in French Patent Specifications Nos. 1,214,157 and 1,472,989 (du Pont), although in this latter case continuous fibrillar tows are obtained, which have to be broken up by cutting and grinding to give fibrils of suitable length for use in the process of this invention. The process of producing the paper of this invention is thus independent of the technique adopted for the production of the fibrils employed; in fact, all fibrils or fibrillar structures composed of a polyolefin which meet the above-mentioned criteria can be suitable, regardless of their method of production.

Preferably, use is made of fibrils wherein at least 50%, and more preferably 50 to 90%, of the total fibril weight consists of polymers containing at least 50% by weight and preferably at least 90% by weight of one or more alpha-olefins containing 2 to 12, and preferably 2 to 6, carbon atoms.

The fibrils are preferably produced from high density polyethylene, but fibrils produced from low density polyethylene, isotactic polypropylene, poly-4-methyl-1-pentene, poly-1-butene and copolymers based on ethylene or on propylene can also be used with success.

The nature and characteristics of the cellulosic fibres used for the production of the separable paper according to the invention are in no way critical. Preferably, however, the cellulosic fibres usually employed for the production of conventional wall papers and posters are utilised.

The weight of the face layer and of the base layer is preferably 40 to 100 g/m<sup>2</sup>, the weight of the intermediate layer preferably being 10 to 40 g/m<sup>2</sup>.

The various layers constituting the separable paper according to the invention can be produced separately from aqueous dispersions or pulps by techniques commonly employed in the papermaking industry, and superposed on one another in the moist state, and subsequently dried under the usual conditions. Instead, however, the various layers can be assembled, after drying, by calendering at a temperature of the order of 140°C. Again, the paper can be produced in machines designed for the manufacture of multi-ply papers and comprising several stuff chests.

Furthermore, the face layer of the paper

according to the invention can be coated with a solution, dispersion, paste or film, for example one based on a vinyl resin, in order to render this layer hydrophobic and thus to produce a washable paper. The face layer can furthermore be decorated or printed by the techniques commonly employed for the production of wallpapers or posters.

The base layer can also be coated with a layer of an adhesive which can be activated with water, for the purpose of producing what are called "pre-pasted" papers.

We have found that the bond between the base layer and the intermediate layer in the paper according to the invention is weaker than that between the intermediate layer and the face layer. Hence, when this paper is adhered to a substrate, the base layer can be left fixed to the latter, being easily separated from the other two layers. Consequently, when stripping, the user can easily remove the intermediate layer and the face layer, and the base layer which is left fixed to the substrate can be covered with a fresh separable paper according to the invention without it being necessary to pretreat in any way the surface to be covered, because the latter remains perfectly smooth.

The paper of the invention is described in greater detail in the Examples which now follow; these Examples do not of course limit the scope of the invention.

#### EXAMPLE 1

A paper was prepared by assembling, in sequence and in the moist state, three sheets *a*, *b* and *c* prepared by conventional papermaking methods and having the following characteristics:

Sheet *a*: A sheet weighing 60 g/m<sup>2</sup>, prepared from a pulp containing only bleached cellulosic fibres (a 50/50 mixture of bleached pine Kraft cellulose and bleached birch Kraft cellulose).

Sheet *b*: A sheet weighing 20 g/m<sup>2</sup>, prepared from a pulp containing only short high density polyethylene fibrils, having an average length of 1 mm and a specific surface area of 10 m<sup>2</sup>/g.

Sheet *c*: A sheet weighing 60 g/m<sup>2</sup>, prepared from a pulp containing 70%, by dry weight, of cellulosic fibres as used for the sheet *a* and 30% of polyethylene fibrils as used for the sheet *b*.

After assembling of the three sheets in the moist state, the paper thus produced was dried under the usual conditions and then calendered at 140°C under a linear pressure of 10 kg/cm.

The paper thus obtained, after first having been decorated, was applied to a substantially plane surface afforded by a plastered wall after applying adhesive to the sheet, using a normal wallpapering paste.

After drying, it was found that it was very easy to pull off the combination of sheets *b* and *c*, with sheet *a* remaining on the said surface.

#### EXAMPLE 2

The procedure followed was as in Example 1, except that the sheet *a* was produced from a pulp containing 90% by dry weight of bleached cellulosic fibres and 10% of the high density polyethylene fibrils employed for producing sheet *b*.

After hanging and drying, it was again found that the combination of sheets *b* and *c* could easily be pulled off, the sheet *a* remaining bonded to its substrate. However, it was found that some fibres of sheet *b* were left bonded to sheet *a*.

#### EXAMPLE 3

The procedure followed was as in Example 1, except that a paper consisting of sheets *a* and *b* was produced by the method described, and sheet *c* was produced separately.

After drying under the usual conditions, the paper consisting of sheets *a* and *b* and the sheet *c* were assembled by simultaneous double calendering at 140°C under a linear pressure of 9 kg/cm.

After hanging and drying, it was found that the combination of sheets *b* and *c* could be pulled off very easily, with sheet *a* remaining bonded to its substrate.

#### EXAMPLE 4

The procedure followed was as in Example 1 except that the bleached cellulosic fibres were replaced by a 65/35 mixture of mechanical pulp and unbleached bisulphite cellulose.

After hanging and drying, it was found that the combination of sheets *b* and *c* could

be pulled off very easily, with sheet *a* remaining bonded to its substrate.

#### WHAT WE CLAIM IS:—

1. A composite paper wherein three layers are superposed on one another, these layers comprising: a base layer, adapted to be applied to a substrate, consisting of at least 90% of cellulosic fibres; an intermediate layer consisting of polyolefin fibrils; and a face layer consisting of 80 to 50% of cellulosic fibres and 20 to 50% of polyolefin fibrils; the percentages being calculated on the dry weights of the constituents, and the layers, concerned.

2. A paper according to claim 1, in which the base layer consists of substantially 100% of cellulosic fibres, and the face layer consists of a paper produced from a pulp containing 25 to 35% of polyolefin fibrils and 75 to 65% of cellulosic fibres; the percentages being calculated as in claim 1.

3. A paper according to claim 1 or 2, in which the polyolefin fibrils employed have a length of 1 to 25 mm and a specific surface area greater than 1 m<sup>2</sup>/g.

4. A paper according to claim 1, 2 or 3, in which the fibrils employed are produced from a high density polyethylene.

5. A paper according to any of claims 1 to 4, in which the weight of the base layer is 40 to 100 g/m<sup>2</sup> and the weight of the intermediate layer is 10 to 40 g/m<sup>2</sup>.

6. A paper according to claim 1, produced by a procedure substantially as indicated in any of the foregoing Examples.

For the Applicants,  
CARPMAELS & RANSFORD,  
Chartered Patent Agents,  
43 Bloomsbury Square,  
London WC1A 2RA.